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ABSTRACT

A brief review is presented of a study on faculty salary equity undertaken during the 1976-77 academic year at the University of Illinois, Urbana. The study was conducted in three phases: description of university policies concerning salaries, determination of the existence of discrimination due to minority group status, and determination of salary adjustments for individual faculty members. The study sought to determine if salary discrimination existed for female or Asian faculty. There were 388 faculty members evaluated. Two separate regression analyses were conducted to determine if either sex or race was significantly related to salary when background and merit factors were statistically controlled. Two committees also evaluated the professional records of faculty, results of the regression analyses, and other information and made recommendations concerning salary adjustments to the college administration. An evaluation of the study model concentrated on two questions: whether the regression analysis procedure allowed all women a fair chance to be identified for review and whether the predicted salary adjustments based on the analysis correlated with actual adjustments based on committee review recommendations. Limitations of the regression analysis method and alternative approaches are discussed. (SW)

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THE USEFULNESS OF A MODEL FOR DETERMINING SALARY EQUITY

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THE USEFULNESS OF A MODEL FOR DETERMINING SALARY EQUITY

In recent years much attention has been focused on the equity of salaries within higher education (Koch and Chizmar, 1976; Cox and Astin, 1977). The legal and moral need to end discrimination is no longer the issue; the focus today is the procedure or method that most fairly determines equitable compensation of any faculty member regardless of race, color, religion, sex or national origin.

A number of different methods or procedures have been used on individual campuses to determine possible salary inequities. Scott (1977), in her "Higher Education Salary Evaluation Kit" published by the American Association of University Professors, lists five major strategies currently being employed, but only two seem to have been used extensively in higher education. The first involves the one-to-one comparison of a member of the minority group with a member of the majority group (usually Caucasian males). This method, known as pairing or counterparting, is fraught with difficulties, not the least of which is identifying the comparable faculty member considered appropriate by both the minority person and the faculty committees or other decision makers.

The second procedure, the most dominant strategy for determining salary equity on individual campuses, has been the use of a statistical analysis of faculty salaries, most often a multiple regression analysis (Braskamp, Muffo, and Langston, in press). It is also the one that the Office of Civil Rights has recommended that some universities use to show compliance with affirmative action (Change, 1978). Measures of faculty productivity and professional experience as well as sex are usually included as predictors of faculty salary. The procedures are intended to fulfill two functions: (a) to determine if discrimination against women or minorities as a group exists in salaries and, if so, (b) to estimate the extent of the discrimination in the salary of each female or minority member. If, for example, comparable male and female faculty, equated on all relevant variables except sex, receive significantly different salaries, then discrimination in faculty salary policies is inferred. In conducting a faculty salary equity study, data for groups of faculty who differ both on measures of merit and on salary may be equated statistically, adjusting the salaries to reflect the differences in merit. These data are then tested to determine if the average adjusted salaries of the two groups are equivalent. If group differences are found, further statistical analyses and/or peer evaluations may be used to determine the extent to which an individual faculty member has been discriminated against. The advantage given for the use of statistical procedures is that techniques such as multiple regression take into account the woman's or minority group member's relative standing on various measures of merit, which can be used to estimate what her or his salary would have been if she or he had been a white male. This estimated salary can then be used as a basis for a salary increase or to "flag" those women and minority group members who appear to have been discriminated against so that they can be reviewed by peer committees.

This paper presents a brief review of the results of a salary equity study at the University of Illinois, Urbana-Champaign, and an evaluation of the model used. Alternative approaches are discussed that can be used to identify individual members of minority groups who might be discriminated against and can be used to adjust salary inequities.

University of Illinois Study

The salary equity review performed during the 1976-77 academic year at the University of Illinois consisted of three main phases:

1. Describing university policies involving salaries.
2. Determining if discrimination due to minority status existed.
3. Determining salary adjustments for individual faculty members.

In the policy phase of the study, the Vice-Chancellor for Academic Affairs, in consultation with an ad hoc campus-wide faculty committee, established that two groups of faculty at the university may have been discriminated against. These groups, called equity groups, were female and Asian faculty. The committee recommended that a multiple regression analysis be used to determine if salary discrimination existed for either of these two groups. In addition, the committee selected the eleven factors to be used in the analyses to predict faculty salaries, basing them on the institutional goals, policies and mission of the campus. Table 1 lists the eleven factors which were chosen and how each was measured for the study.

In the review process, it was decided that if women and/or Asians as groups had salaries significantly below those of the white males following the salary adjustments based on the eleven predictors, then the equity group would be selected for further review. The individual faculty members of the equity groups selected for further review would be examined, and those faculty whose predicted salaries exceeded their actual salaries by amounts greater than cut-offs selected by the ad hoc committee would be "flagged" for peer committee review. The ad hoc faculty committee selected cut-off values for inclusion in the peer reviews of \$1700 for full professors, \$1250 for associate professors, \$1000 for assistant professors and \$750 for instructors. These values were selected not on a statistical basis but rather on the basis of the amounts which the committee members felt represented significant differences for individual faculty. The use of these cut-offs did not guarantee any increase, since they were used only to identify individual faculty for peer review. On the other hand no one was automatically excluded from review, since all faculty members in the equity group were given the option to request a peer review if they were not identified for review by the regression analysis.

All full-time women and Asian male faculty members (Asian females were included with women) were initially included in the review process as potential equity groups. For comparison purposes, a stratified random sample of Caucasian males matched by department only was selected so that the number of white males would equal as nearly as possible the number of women and Asian male faculty. In each department, faculty with administrative appointments and those not evaluated by traditional means, such as publications, were eliminated.

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After all relevant data available from University records were compiled, computer-generated forms were sent to all faculty members in the study, asking that they verify the information already on the form and provide additional information on their professional achievements. Of the 430 faculty included in the study, 395 returned the questionnaire, for a response rate of 92%, though seven of the forms could not be used. Complete data were obtained for 119 males matched with females, for 56 males matched with Asians, for 153 females, and for 60 Asians, for a total of 388.

Two separate regression analyses were conducted to determine if either sex or race was significantly related to salary when background and merit factors were statistically controlled. Since females were the only equity group found to have salaries different from comparable males, they alone were included in the second stage of analyses. In this stage, a regression analysis was performed on the sample of males matched with the females, using the eleven predictors previously described to predict salary. Based on the eleven-variable prediction equation calculated from the data of the sample of 119 males, seventy-seven of the 153 females were found to have predicted salaries which were larger than their actual salaries by amounts exceeding the cut-off values and were thus recommended for review by peer committees. The group identified for further review contained 71% of the female instructors, 49% of the female assistant professors, 58% of the female associate professors, and 15% of the female full professors. Of the 77 women identified for review, 2 left the university and 19 asked to be excluded, while four not identified for review asked to be included, bringing the total reviewed to 60.

The final phase of the review process for the female faculty members was a two-tiered committee review, with each of the 60 women first reviewed by a school or college peer committee and then by a campus-wide committee. Acting under the guidelines for committee reviews issued by the Vice Chancellor for Academic Affairs, the school and college review committees appointed by their college deans were asked to evaluate the professional records of each of the eligible women. Information used in the reviews was to include the results of the regression analysis plus other materials available in the departments such as reprints of publications and evidence of teaching and public service performance. In addition, the committees had the option of interviewing the women being reviewed. Then these school and college level committees were directed to determine equitable salaries for each of the women reviewed, without regard to whether or not any inequities were due to sex discrimination.

The recommendations of the school and college committees next went to their directors or deans who added their own recommendations and forwarded the reports to the campus-wide committee for final review. The recommendations of the campus-wide committee thus finally reached the Vice-Chancellor for Academic Affairs, who was responsible for the actual implementation of the recommendations. Once the salary adjustments had been made, the special review process for the female equity group was considered completed.

This review process at the University of Illinois was considered special because it took place outside the normal channel of appeal whereby individual faculty members (including Caucasian males) can appeal their own salary cases on an individual basis. Only in cases where discrimination appears to have occurred against an entire group can all the members of the group participate

in the review process as described above. This special review process can be initiated, however, any time there is evidence to suggest that a group as a whole has been discriminated against.

Evaluation of the Model

The evaluation of the model used at the University of Illinois consisted of answering two questions:

1. Did the regression analysis procedure allow all women a fair chance to be identified for review?
2. Did the predicted salary adjustments based on the regression analysis correlate with actual salary adjustments based on recommendations of peer review committees?

Our answers are based on our experiences at the University of Illinois; the "goodness" of the model may vary from institution to institution.

The first question is difficult to answer. Women with larger discrepancies between their actual and predicted salaries tended to have lower actual salaries ($r = -.41$), which might suggest that something about the statistical process was favoring women with lower salaries. If the correlations between discrepancy and initial salary are negative, and if the regression model is used to predict the best estimate (fairest?) salary of a faculty member, then faculty with low salaries would on the average have a higher predicted salary than actual salary. Faculty with high actual salaries would tend to have lower predicted salaries in this case. However other reasons are possible. Women with lower salaries may be discriminated against to a greater extent.

We can not tell from the data or from the results of the analysis whether or not all women received a fair chance of review. We can only say that the procedure (methodology) was an objective attempt to model the way in which the Caucasian males were paid. The concept of giving salaries to women as though they were men is logically consistent with the principle of equal pay for all faculty with equal merit doing equivalent work.

Other problems needed consideration. The variables used in the regression equation did not exhaust all the factors that were used in making salary decisions. The measurement of the variables also did not capture the qualitative importance of the values assigned. For example, it is much easier to measure quantity of publications than to interpret a combined variable of quantity plus quality.

In sum we can not definitely determine if the regression analysis is fair in identifying females for review. However, the regression analysis did not provide the "last word" on which faculty members were to be reviewed. Any faculty members who thought they should be reviewed by colleagues were also given the opportunity to be reviewed.

The second question concerning evaluation of the model relates to the correlation between regression-analysis-based adjustments and peer recommendations. Did salary adjustments given to 32 of the 60 women reviewed correlate

with predicted salaries? A correlation of .04, which is not significantly different from zero, was computed between the actual salary adjustments of the 32 women and the difference between their predicted and actual salaries (the predicted increase, in a manner of speaking). In addition, three of the four women who were below the cut-off values but who asked to be reviewed did, in fact, receive increases. We can suggest several reasons for the low correlation and for the raises given the three women who requested special reviews. First, the amount of variability of salary adjustments was small within a college or school although the size of the discrepancies between the predicted salaries and the actual salaries was much more variable (the highest discrepancy was over \$10,000). Early in the review process the committees were told not to place too much emphasis on the predicted salaries in the reviews due to possible errors in prediction. And finally, the committees had information available which was not included in the regression analyses.

The three women not identified for review but receiving increases were close to the cut-off values. The fourth woman, who received no increase, was not. In the peer review, the four women presented additional information about achievements beyond that included in the regression analysis. These women felt they were the exceptions to the rule, and three of the four were right if the committee recommendations are used as the standard.

Discussion

Regression analysis can be used to identify possible discrimination among groups but there are problems with its use. Among the problems is the fact that it is virtually impossible to avoid violation of several of the basic statistical assumptions required for meaningful interpretation of the results (e.g., bivariate distributions). While the statistic is robust enough that such violations are often of minimal consequence, the violations do provide a basis for legitimate complaint from anyone who cares to protest the procedure. One problem includes the possibility of regression to the mean which could inflate the size of the predicted salaries of equity group members with lower professional qualifications (merit) and lower salaries than the group of white males. Birnbaum (1977) has discussed several of the problems encountered in the use of regression analysis in studying salary equity. Other problems include the possibility that the relationship between the predictors and salary may be non-linear, inadequate adjustments due to inter-disciplinary differences in salary structure and importance given to different criteria, the need to have large enough numbers of faculty within a discipline to yield reasonably stable regression weights, and the difficulty of obtaining all the desired data for use in the regression equation. However, regression analysis does allow the university community to summarize and integrate a large mass of data and statistically identify possible salary discrimination.

Regression analyses have been used in several ways to determine salary adjustments for individuals of minority status who have been inferred to be discriminated against. At the one extreme the predicted salary of a minority member is given considerable weight in determining the adjustment. However, in our opinion, if a regression equation is used as a formula, two serious problems must be dealt with. First, since the predictors in the

regression analysis will not account for all of the variability in faculty salaries, errors of prediction are a necessity. While a predicted salary is the best estimate of an equitable salary based on the relationship between the factors included in the regression equation and salary of the counterfactual group, it may not be the "fairest" for an individual. The fairest would include a consideration of additional factors not included in the regression analysis.

There is also a legal problem. In the case "Board of Regents of the University of Nebraska vs. A. Neil Dawes," the U.S. Supreme Court upheld the decision of the 8th circuit court of appeals that it is against the Equal Pay Act of 1963 to apply a formula to only one sex. The formula used was not based on any sophisticated statistical analyses. At issue, however, was the application of a salary schedule or formula to only one sex, not the derivation of the formula. While we can't offer a legal opinion, it seems plausible that giving only women a salary increase equal to the discrepancy between actual and predicted without giving the discrepancy increase to males would be ill advised. (We know of no university that has used this practice.)

Regression analysis is based on past practices of awarding salary increases to a group of faculty, usually males. It cannot incorporate present standards and future plans. For example, suppose teaching excellence is to be given additional weight in salary increases this year. Should this additional criterion be considered when inequity is considered? If one wishes to correct for previous salary inequities, it should be ignored; however, if current policies regarding salary distributions are to be used, then previous practices which will be detected by a regression analysis may not be the most defensible basis for awarding salary adjustments. Given a limited number of funds for salary increases, a university must establish its priorities on what is to be rewarded. Either salary increases are given to faculty who should have earned more based on criteria employed in previous years or to those whose performance is currently valued and will be valued in the future. Which is more humane and fair? Which is more beneficial to society and to the future of the institution? Regression analysis used as a technique to identify faculty with possible sex discrimination reflects the consequences of previous decisions.

An alternative mentioned earlier is to use the predicted salary to "flag" females for further review. This procedure, which is endorsed or at least implicitly endorsed by the AAUP, has some advantages primarily in reducing the amount of administrative time required to examine salary discrimination of all persons of minority status. However, both technical and credibility problems can't be avoided. Technically, the regression analysis as a tool can be critiqued for its inability to detect all of the factors and their interrelationships that are involved in salary determinations. All of the problems encountered in determining group differences are also applicable here. If some segment of the group is deleted from review by some "imperfect" tool, faculty may consider it unfair. Consequently its credibility is called into question and the defense of its use alone may be ill advised both politically and legally.

Using regression to "flag" members for review presents another set of problems. For example, the standard error of estimate is usually quite large due to large

variability of salaries despite a relatively large multiple correlation (in our study $R = .79$ for white males, with a standard error of estimate = \$3861). Thus a great deal of uncertainty has to be attached to the predicted salary. The large errors should also be considered in choosing any cut-off used to select women for further review. The cut-offs should be very conservative to assure that no one who should be reviewed is missed due to an error of prediction. (Scott, 1977, recommends that any woman with a predicted salary greater than actual should be identified for review.)

There is also the problem of interpreting the discrepancy between predicted and actual salary. Since there is an imperfect correlation between measured merit and salary, faculty with similar merit values on the measured variables will not have the same salary. This is true for both the men and the women. For men the discrepancies represent individual variability due to factors not included in the regression equation. However, for women, the discrepancy includes both individual variability and possible bias. Thus when a regression equation is used to estimate the size of a salary adjustment for women, both bias and individual variability are included. There is no easy way to separate the discrepancy into an amount due to sex discrimination and an amount due to non sex-related merit factors. In some cases most of it may be due to sex whereas in others none of it may be. Since the individual variability is shared by the male faculty, half of the males will appear underpaid by the regression analysis but will receive no opportunity to have their salaries increased. Can a technique to identify people for possible salary adjustments be applied only to one sex or do the men who have predicted salaries lower than actual salaries also have to be identified for review? If the review process only focuses on the salary of each individual from the minority group and the possibility of a lower salary due only to sex discrimination, then flagging only individual members of the minority group and the ensuing review process seems reasonable. However if the review process entails a determination of discrimination in salaries regardless of the "cause," then it seems reasonable to open the review process up to all members regardless of group status. (This strategy takes into account the problem of allowing only women a review when in fact there is no discrimination against salaries on campus due to sex; i.e., as a group males and females are treated equitably.)

A compromise strategy, then, is to use the regression analysis to "flag" women and also to allow males as well as women not identified for review by regression analysis to be included in the review process if they consider their current salary to be unfair. This strategy gives all persons the opportunity for due process and is consistent with the principle that it is more serious to delete persons with salary discrimination than it is to review persons with no discrimination.

In conclusion, if a salary equity review process serves its intended purpose, the procedures used in the review process should have as goals:

1. elimination of the effects of bias by providing salary adjustments to all deserving members of the equity groups, and
2. provision of a review process for anyone who wishes to be reviewed.

Multiple regression in conjunction with peer reviews can be used to meet the first criterion; some form of "optional" peer review for Caucasian males would meet the second. As the material presented in this paper demonstrates, there are many potential technical and legal hurdles in attempting to meet these objectives. With the current tools available, the best one can do is make an honest effort at approximating the goals.

Table 1

Measured Definition of Each Factor

Factor	Measured Definition and Description
Average Departmental Assistant Professor Salary	Average 1976-77 academic year salary of assistant professors in each department.
Years at Present Rank	Number of years since promotion to highest rank.
Highest Degree	B.A., M.A. or equivalent, Ph.D. or other terminal degree.
Appointment Status	Nine or eleven month appointment.
Professional Experience	Number of years of full-time equivalent professional work experience as of August 20, 1976.
Publications	Number of manuscripts by category that appeared in print or papers that had been presented from August 20, 1970 to February 1, 1976. Book chapters noted by faculty on the form were included in the last category.
1) Books	
2) Books Edited	
3) Reviews	
4) Journal Articles	
5) Bulletins, Tech. Reports, Papers	
Grant Dollars	Total dollar amount of grant received by faculty member as either director or co-director (prorated by number of co-directors) from 1964 or initial date of employment at U of I, if later, to July 1975.

Salary Equity, 8.

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